one hand, and to polar regions on the other, or even to have had their origin in these regions; and that the idea of two great atmospheric currents having in storms a common *plane of meeting* (Begegnungs-fläche) is a mere supposition. Such statements as these: "The storm is the *conflict* of air-currents," and "the barometric depression is the *effect* of their movement," are, to say the least, altogether unwarranted in the present state of our knowledge.

The tornado is conceived as originating from the sultry calm felt before it, which is due to the conflicting of the two aerial currents, bringing about a state of equilibrium by the great compressive force they exert against each other. This equilibrium is disturbed by a particular uneven configuration of the earth's surface, and the disturbance produces the tornado. Leaving out of view the imagining action of conflicting aerial currents, it will be enough to point to the geographical distribution of tornadoes as disproving this theory of their origin.

Notwithstanding these very serious drawbacks, the book will repay perusal as being the production of one who not unfrequently gives evidence of acute observation, and who has thought out his subject for himself. The following may be given as specimens of what are repeatedly to be met with:—"Meteorology is fully as much a science of the earth's surface as of the air." "The wind changes, not by the veering around of one and the same current, but by a succession of different currents, blowing inwards." "Among the meteorological elements the real direction of the wind is the most difficult to arrive at, especially at observatories above cities or near mountains and coasts, and wind observations are therefore in general the least reliable." "The thermometer, as measuring a primary effect, is, with the hygrometer, at least as important as the barometer."

The theory of atmospheric movements remains still to be stated, and it needs scarcely be added that this cannot be done till we have a better knowledge than we yet possess of the physics of the atmosphere with its vapour, and of the merely mechanical effects of ascending, descending, and horizontally-flowing currents of air.

ANDERSON'S "MANDALAY TO MOMIEN"

Mandalay to Momien: A Narrative of the Two Expeditions to Western China of 1868 *and* 1875, *under Col. E. B. Sladen and Col. Horace Browne.* By John Anderson, M.D., F.R.S.E., &c., Curator of Imperial Museum, and Professor of Comparative Anatomy, Medical College, Calcutta. With Maps and Illustrations. (London: Macmillan and Co., 1876.)

MANY details concerning the latter of the expeditions referred to in this volume have been made known in this country through the daily papers, in connection with the much-to-be regretted murder of Mr. A. R. Margary. Indeed, Dr. Anderson states that his work was suggested by the interest called forth by the repulse of the recent mission and the tragedy attending it. The principal object of both expeditions was to prepare the way for establishing an overland trade-route between Burmah and China, and thus save the delay and expense of a roundabout sea voyage. That the establishment of such a route is desirable from a commercial point of view is maintained by all who have a knowledge of the circumstances, and in the meantime appears to have been frustrated by the machinations of native traders who think it their interest to shut out British enterprise from a field which is evidently capable of great development. This uncivilised shortsightedness will no doubt in the end be defeated, though in the meantime it has cost this country the loss of a brave and accomplished servant.

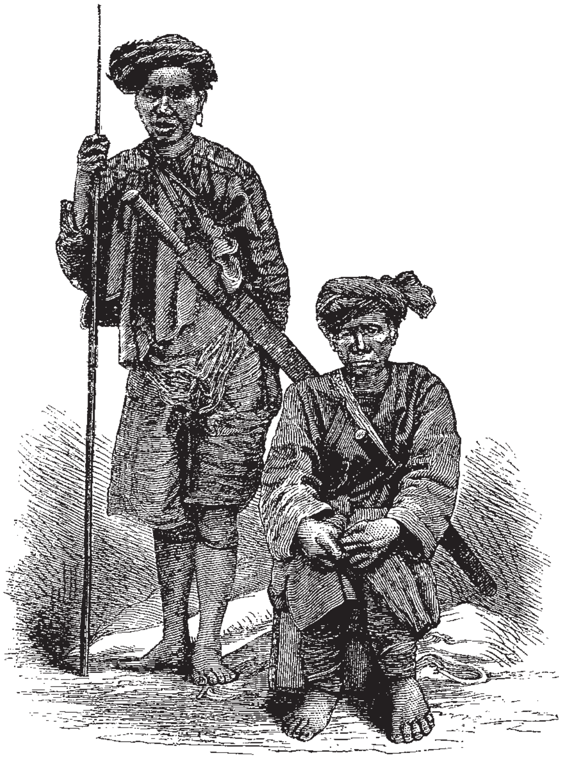
Dr. Anderson, who was medical and scientific officer to both expeditions, does not pretend to give in the present volume more than a narrative of the general work of the expedition; a full and illustrated report of the natural history results, is, however, we are glad to learn, in active preparation, and will be published by the aid of the Indian government. Meantime, in the very interesting narrative before us, numerous details will be found of value from a scientific point of view. Dr. Anderson has made use not only of his own notes, but to some extent of those of other members of the expeditions, and has evidently studied with care the results achieved by the French expedition from Saigon to Yunnan under Lagrée, Garnier, and Carné, as well as the literature of the subject generally. The result is that the reader will obtain a clear account of the British connection with the route referred to, and be in a position to understand the present state of affairs and future negotiations.

The real starting-point of the first expedition under Col. Sladen, was Mandalay, the capital of Burmah, which was founded by the present king only in 1853, but which is already a large and evidently well-constructed city. An interesting description of Mandalay, and of the royal court, and some of its customs, is given by D. Anderson. From this point the party sailed in a steamer up the Irawady to Bhamo, which is about thirty miles from the boundary between Burmah and Yunnan, and is the headquarters of the Chinese traders who seem at present to monopolise the trade between Burmah and Western China, and whose opposition had no doubt much to do with the difficulties encountered by both expeditions. After many troubles with regard to carriers the expedition left Bhamo and proceeded by Ponline, Ponsee, Manwyne and Nantin to Momien, beyond which it could not proceed.

Yunnan was at the time in a state of anarchy caused by the rebellion of the Panthays, or Chinese Mohammedan population of this region, which added greatly to the difficulties and dangers of the expedition. Nevertheless, even from a commercial point of view, it seems to us much was accomplished, but probably more from a scientific point of view. The natural history results, we have said, are being prepared for publication, but in the present volume the geologist, and especially the ethnologist, will find a great deal that is valuable and interesting. Dr. Anderson has evidently taken careful notes as he journeyed along, and a somewhat minute description of the course of the Irawady and of the country on its banks, and its antiquities between Mandalay and Bhamo will be found in the work. There were so many delays between Bhamo and Momien that Dr. Anderson had many opportunities of studying the country and the people, and these he evidently took ample advantage of. To the Kakhyens and Shans especially he paid great attention, and his account of these peoples must be considered a valuable contribution to ethnology.

The Kakhyens especially are a very interesting race. They inhabit the mountains on the border-country between Burmah and China, and Dr. Anderson considers them as cognate with the hill tribes of the Mishmees and Nagas. The name Kakhyen is a Burmese appellation, and the people are widely spread under other names, as Singphos, Kakoos, &c. They do not seem, however, to be a genuine aboriginal population in Burmah and China as so many hill-tribes are elsewhere.

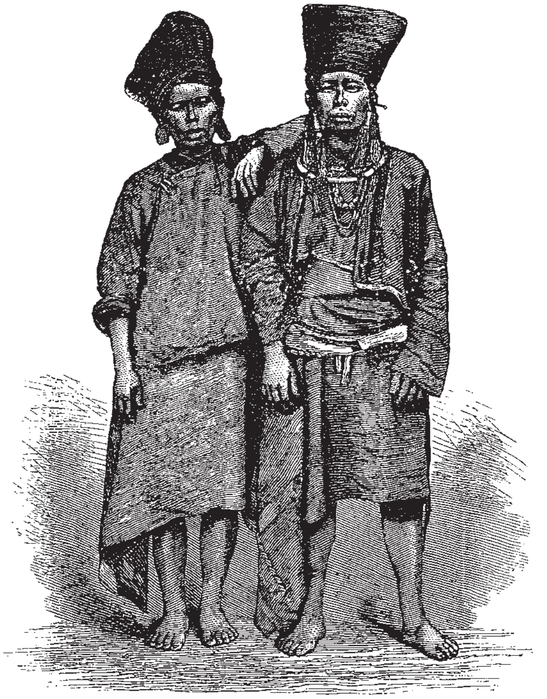
"By their own account the hills to the north of the Tapeng, for a month's journey, are occupied by kindred tribes. South of the Tapeng, they occupy the hills as far as the latitude of Tagoung, and, as mentioned, were met with on our voyage near the second defile. To the east, they are found occupying the hills, and, intermixed with the Shans and Chinese, almost to Momien. Here they, as it were, run into the Leesaws, who may be a cognate, but are not an identical, race. The two chief tribes in the hills of the Tapeng valley are the Lakone and Kowrie or Kowlie, but numerous subdivisions of clans occur. All are said to have originally come from the Kakoos' country, north-east of Mogoung; and Shans informed us that two hundred years ago Kakhyens were unknown in Sanda and Hotha valleys. To give one instance of their migrations. The Lakone tribe have at a very recent period driven the Kowlies from the northern to the southern banks of the Tapeng. A Lakone chief, having married the daughter of a Kowlie, asked permission to cultivate land belonging to his father-in-law; receiving a refusal, he took forcible possession, and drove the Kowlies across the river to the hills where they now dwell."



Kakhyen Men.

The Kakhyens are divided into numerous tribes or clans, between which there does not appear to be any strong common bond of union. Indeed, in very many respects, the system of government, if it may be so called, which exists among these half wild tribes, reminds us strongly of that which prevailed in the Scottish Highlands in the so-called "good old times," before the abolition of the hereditary jurisdictions. They have many curious superstitions and customs, which Dr. Anderson describes with great minuteness. Everything in "the heavens above, the earth beneath, and the waters under the earth" seems to have its particular "nat" or spirit; "every accident or illness is the work of some malignant or vindictive one of 'these viewless ministers.'" The will of these "nats" is consulted by means of a medium, who works himself up into a state of great agitation, so as to become "possessed." The Kakhyens are not very bold warriors, though they are great braggarts, and very troublesome to deal with. They are altogether a very interesting people.

With regard to the wide-spread Shan race, also, many details will be found in the volume, the result both of Dr. Anderson's own observation and of the observations of previous explorers. The Shans of Yunnan belong to the Tay-Shan or Great Shans of the Tai-race, the branches of which, under different names, are found extending to the eleventh parallel, their various states being tributary to Siam, Burmah, and China. The Shans of Burmah have become closely assimilated to the Burmese in all respects; the Yunnan Shans are the remnants of the Shan Kingdom of Pong, conquered by the Chinese in the fourteenth century, and which included part of Burmah.



Kakhyen Matrons.

"The Shans proper of these valleys are a fair race, somewhat sallow like the Chinese, but of a very faintly darker hue than Europeans, the peasantry, as a rule, being much browned by exposure; they have red cheeks, dark brown eyes, and black hair. In young people and children, the waxen appearance of the Chinese is slightly observable. The Shan face is usually short, broad, and flat, with prominent malars, a faint obliquity and contraction of the outer angle of the eye, which is much more marked in the true Chinese. The nose is well formed, the bridge being prominent, almost aquiline, without that breadth and depression characteristic of the Burman feature. The lower jaw is broad and well developed; but pointed chins below heavy, protruding lips are not infrequent. Oval faces laterally compressed, with retreating foreheads, high cheek-bones, and sharp retreating chins, are not infrequent; and the majority of the higher classes seemed to be distinguished from the common people by more elongated oval faces and a decidedly Tartar type of countenance. The features of the women are proportionately broader and rounder than those of the men, but they are more finely chiselled, and wear a good-natured expression, while their large brown eyes are very scantily adorned with eyebrows and eyelashes. They become much wrinkled by age, and, judging from the numbers of old people, appear to be a long-lived race. They are by no means a tall people, the average height for men scarcely reaching five feet eight, while the women are shorter and more squat in figure.

A minute account of these people, their manners, customs, dress, &c., is given by Dr. Anderson. Some of the ornaments worn by the women are of most artistic workmanship.

The latter part of the volume contains a clear account of the second expedition undertaken to open a trade route between Burmah and China, but which, as we have said, came to an untimely and sad end about a year ago in the murder of Mr. A. R. Margary. Dr. Anderson sets forth the whole circumstances with evident fairness, and yet it is difficult to say exactly who was to blame in the matter. That such a trade-route as it was attempted to establish would be of great advantage to all concerned, there is no doubt; and no doubt also it only requires time to establish it. There is yet a very great deal to be learned both with regard to the natural history of that part of the world, and with regard to the several interesting races of people which form its population. Dr. Anderson's work is a valuable contribution to such a knowledge, and the clear and straightforward manner in which he writes adds greatly to the intrinsic interest of the information with which his pages teem. The illustrations of the country and the people are charming, and the two maps enable the reader to follow satisfactorily the footsteps of the explorers.

OUR BOOK SHELF

A Class-book of Chemistry. By Edward L. Youmans, M.D. (London: Henry S. King and Co., 1876.)

"THIS book is not designed as a manual for special chemical students. It aims to meet the wants of that considerable class, both in and out of school, who would like to know something of the science, but who are without the opportunity or the desire to pursue it in a thoroughly experimental way. Such a class-book as the present . . . . must be but a brief compendium of general principles and descriptions of the most important substances, and is not to be judged of by the fulness of its details." This extract from the author's preface sufficiently explains the objects which he has had in view in compiling the book before us. Certainly the work has no claims as a textbook for students; for the general reader we are afraid it will prove of little interest. Within the compass of about 350 pages we have an account of Gravity, Heat, Molecular Attraction, Electricity and Light, besides Chemistry proper. Surely the day has passed when this kind of thing could be tolerated in a book which professes to teach science. People cry out against the teaching of science as a regular part of educational discipline. It is all very well in its own place, they say, but the only true mental training is to be derived from a study of classics.

If boys and youths devote years to the careful study of ancient languages, they can scarcely fail to receive at least some benefit. If, on the other hand, they pass rapidly through a course of training (?) in science, with the aid perhaps, of such a book as that before us, they quickly forget what they have learned, and, so far as mental training is concerned, they had better have left science alone altogether. Our chief objection to the present work is that it seems calculated, probably unconsciously calculated, to further the delusion that science is a thing to be taken up in a leisure hour, but not a thing the study of which requires, while at the same time it increases, every activity of the mind. If the study of science is to be made a discipline, that study must not be pursued in the spirit of Dr. Youmans' book. The student must not content himself with a superficial knowledge of a few facts, nor even with gaining one or two generalisations; he must be taught to amass facts on the basis of his own observation, to separate the more important from the less important facts, to classify these facts and at last to rise to a generalisation which shall enable him to group together and so explain what had appeared to be isolated phenomena. Dr. Youmans' book can afford the student little help in such a process as this.

Of course it must be admitted that there is a large class of people who have neither leisure nor inclination to make science a study, but who are nevertheless desirous, and properly desirous, of knowing something of what science has done and of the way in which she has accomplished her work. Such people will, we are afraid, receive but little enlightenment from the work we are noticing. There is just sufficiency of detail to make the whole subject appear uninviting, but not enough to make the book valuable to the student. The mass of isolated facts is too great for the ordinary reader; he would soon, if not bewildered, become fatigued.

A book designed for the purposes stated in the preface to the present work requires to be written more from the standpoint of some central idea, round which is grouped together such a number of facts as may serve to illustrate and enforce that idea. The relation of the facts to the general theory and of the theory to the facts may then be made the means of inculcating a certain amount of true scientific training.

While we thus complain of the general scope of Dr. Youmans' book, we must give the author praise for the manner in which some parts of his work are written, more especially the chapter on theoretical chemistry. The chapters on descriptive chemistry are exceedingly meagre in details, but pretentious in the ground which they *appear* to cover.

M. M. PATTISON MUIR

Injurious Insects of Michigan. By A. J. Cook, of the Michigan State Agricultural College. Fourth Report of State Board of Agriculture for 1874.

THIS useful and instructive pamphlet is to a great extent compiled from the writings of Messrs. Riley, Fitch, Le Baron, Walsh, Harris, Curtis, and Packard. It is illustrated by numerous woodcuts from the able pencil of the justly celebrated Prof. Riley, of Missouri. Its object is to enlighten farmers, gardeners, and fruit-growers of the State of Michigan, as to the general appearance, structure, and habits of noxious insects; at the same time suggesting means by which the increase of these pests to agriculture may be arrested. The "Colorado Beetle" and the "Grape Phylloxera" occupy a conspicuous place among these enemies of man.

The pamphlet winds up with a valuable hint to house-